CHAPTER 25

ELECTRICAL CONTROLS

25-1. Minimum maintenance activities for electrical control systems

The tables located at the end of this chapter indicate items that must be performed to maintain systems and equipment at a minimum level of operational readiness. The listed minimum action items should be supplemented by manufacturers-recommended maintenance activities and procedures for specific pieces of equipment.

25-2. General maintenance procedures for electrical control systems

Maintenance actions included in this chapter are summarized in table 25-1. Additional maintenance tasks associated with specific electrical equipment are included in subsequent tables. Inspection frequencies may be increased as required based on observations and experience. Because of the sophisticated electronics utilized in electrical control systems, specially trained personnel may be required to perform certain preventive maintenance tasks. Factory representatives or service companies are available should in-house personnel not be comfortable with performing these tasks.

a. Typical electrical control system maintenance. Maintenance activities common to all control systems include the following.

(1) Personnel should review past maintenance records to find repair patterns. These records may point to certain components that should be closely inspected during performance of preventive maintenance.

(2) Review operator records looking for trouble entries.

(3) Perform a general inspection of control system components as described below.

(a) Inspect to ensure that voltage warning signs exist on equipment like power supplies.

(b) Inspect enclosures for damage, unauthorized openings, and corrosion of metallic objects. Repair and paint as required.

(c) Inspect air passages and remove any blockage.

(d) Inspect, investigate, and solve conditions for unusual odors.

(e) Inspect locking devices. Repair as required.

(f) As equipment is operated and tested, listen, investigate, and solve conditions for unusual noises.

(g) Inspect for loose wiring and components.

(h) Inspect electrical connections for degradation. Repair as required.

(i) Inspect electrical insulation for discoloration and degradation. Repair as required.

(j) Inspect equipment grounding components such as conductors and connections. Repair as required.

(k) Inspect indicating lights for correct illumination.

(4) Remove debris, dirt, and other foreign deposits from all components and areas of non-encapsulated equipment such as ventilated equipment, etc. Replace equipment ventilation filters as required.

(5) All electrical connections should be torqued to the proper design value.

(6) Control systems may have backup or redundant equipment such as power supplies or central processing units (CPUs). This equipment should be placed in service by simulating conditions one might expect to cause a transfer.

(7) Conduct Simulation of manual and automatic control sequences. Because of the complexity, number of, and variety of manual and automatic control sequences, it is not within the scope of this manual to describe specific tests. Simulation of control sequences should be all-inclusive to the extent that personnel are confident the control system will respond correctly should an actual similar event occur.

b. Manual control system. Verify continuity of selector switch, push buttons, and starter contacts. Repair or replace as recommended by the manufacturer.

c. Programmable Logic Controller (PLC) and Distributed Control System (DCS) maintenance. PLCs and DCSs have been designed with ease of maintenance in mind. Virtually all components are solid state, so maintenance is reduced to the replacement of modular, plug-in type components. Fault detection circuits and diagnostic indicators indicate if the component is working properly. Processors have self-diagnostics to indicate their operating status.

(1) Run operator initiated self-diagnostic programs as most units will be provided with some form of diagnostic software.

(2) Volatile memories may have battery backup to maintain programs during loss of normal power sources. Batteries should be tested to ensure memory will not be lost should normal power fail.

(3) Most electronic control equipment will have indicating lights that should be verified for proper status.

d. Relays. Electromechanical relays shall be inspected as described below.

(1) Conduct inspection of unit. Closely examine contacts for degradation. Repair or replace as required.

(2) Perform contact conductivity test. Verify continuity of critical starter and relay contacts. Repair or replace as recommended by manufacturer.

e. Control panels. Calibrate and test control panels as described below.

(1) Using calibrated test instruments, calibrate ammeters, voltmeters, etc. Verify continuity of metering selector switch contacts with ohmmeter.

(2) Actuate each alarm input for the correct response. Use corrective measures as required.

Table 25-1. Electrical control system

Electrical Control Svstem	
Action	***Frequency***
WARNING! MAINTENANCE PERSONNEL SHALL LOCKOUT/TAG EQUIPMENT TO ENSURE DE-ENERGIZATION DURING MAINTENANCE PROCEDURES.	
General Maintenance	
Review maintenance records.	6 mos
Review operator records.	6 mos
Inspect electrical control systems for the following.	
Inspect to ensure that voltage warning signs exist on equipment like power supplies.	yr
Inspect enclosures for damage, unauthorized openings, and corrosion of metallic objects. Repair and paint as required.	yr
Inspect air passages and remove any blockage.	yr
Inspect, investigate, and solve conditions for unusual odors.	yr
Inspect locking devices. Repair as required.	yr
As equipment is operated and tested, listen, investigate, and solve conditions for unusual noises.	yr
Inspect for loose wiring and components.	yr
Inspect electrical connections for degradation. Repair as required.	yr
Inspect electrical insulation for discoloration and degradation. Repair as required.	yr
Inspect equipment grounding components such as conductors and connections. Repair as required.	yr
Inspect indicating lights for correct illumination.	yr
Clean equipment.	yr
Tighten electrical connections.	yr
Verify operation of backup equipment.	6 mos
Simulate manual and automatic control sequences.	yr
Manual Control System	
Perform contact conductivity test.	yr
PLC/DCS Systems	
Run diagnostic programs.	6 mos

Table 25-1. Electrical control system (continued)

Electrical Control Svstem	
Action	***Frequency***
Test batteries.	6 mos
Verify indication lights.	6 mos
Relays	
Inspect contacts for degradation. Repair or replace as required.	yr
Perform contact conductivity tests.	yr
Control Panels	
Using calibrated test instruments, calibrate ammeters, voltmeters, etc.	yr
Verify continuity of metering selector switch contacts with ohmmeter.	yr
Verify alarms.	yr